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A new species of *Cyclemys* (Testudines: Bataguridae) from Southeast Asia

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Abstract.—A new species of batagurid turtle, *Cyclemys atripons*, is described from the mountainous areas of southeastern Thailand and adjacent Cambodia. It differs from other *Cyclemys* (herein all referred to as *C. dentata*) by the unique combination of a head mottled with black dorsally and striped laterally, a nearly immaculate chin, a distinct carapace pattern, a plastron with no or only a few coarse black rays, a coarsely and densely pigmented bridge, a narrow carapace, a long plastral hindlobe, a wide plastral forelobe, a small gular scute, and a long interhumeral seam length. Discriminant function analysis of 17 morphometric characters standardized for body size supported the distinctiveness of the new species from *Cyclemys dentata*, and indicated that other populations of this complex (on Borneo and in China) may also be morphologically distinct.

The genus *Cyclemys* is currently envisioned by most authors to comprise two species (*C. dentata* Gray 1831 and *C. tcheponensis* Bourret 1939) with very uncertain distributions (Ernst & Barbour 1989, Iverson 1992). *Cyclemys dentata* was originally described by Gray (1831:20) as *Emys Dhor* (type locality: "Bengal . . . Java"), but he corrected the name to *Emys dentata* in the Errata of that publication. However, for the next 100 years the species name *dhor* was used by most authors (including Gray on occasion, e.g., 1870 and 1872). During that period several additional names (now recognized as synonyms) were applied to this taxon: *Cyclemys orbiculata* Bell 1834; *Cistudo diardi* Duméril & Bibron 1835; *Cyclemys oldhami* Gray 1863; *Cyclemys ovata* Gray 1863; and *Cyclemys bellii* Gray 1863. Stejneger (*in* Barbour 1912:143) and Smith (1930:8) both argued that the correct species name is *dentata* and nearly all authors subsequent to Smith have used the latter name. As defined by Smith, *C. dentata* ranges from northeastern India to southwestern China, and through southeast Asia to Sumatra, Java, Borneo and the Philippines (Taylor 1920, Smith 1930, Zhao & Adler 1993).

In 1939, Bourret recorded *C. dentata* from Hanoi, Vietnam, but described *Geoemyda tcheponensis* from central Vietnam, based on a juvenile in the Hanoi Museum. Wermuth & Mertens (1961) first recognized the similarity of *G. tcheponensis* and *C. dentata* (even though the two species were originally described in separate genera) and synonymized the former under the latter. In a comprehensive study of the generic relationships among all the pond turtles (emydines and batagurines), McDowell (1964) supported that synonymy. However, in 1976, after examining 16 pet trade or market specimens of *Cyclemys*, McMorris argued that *tcheponensis* and *dentata* were distinct species characterized by color pattern differences (the former having a head mottled dorsally and striped laterally, and the latter lacking head and neck stripes and having the dorsum of its head uniform brown). During the following 20 years, most authors have cautiously recognized

both, pending further study (e.g., Pritchard 1979, Ernst & Barbour 1989, Iverson 1992). A single anomalous specimen of *Cyclemys* with only 11 marginal scutes per side was described from southern Yunnan, China by Kou (1989) as *C. tiannanensis*, but that name was quickly synonymized with *dentata* by Das (1991:80) and Zhao & Adler (1993:167).

In 1994, distinctive turtles labelled as *Cyclemys dentata* began appearing in the pet trade from southeast Asia. According to the exporters, these turtles originated from Tonle Sap, near Phnom Penh, Cambodia (Anson Wong, pers. comm.). These unique turtles clearly belonged to the genus *Cyclemys* (sensu McDowell 1964), but in order to compare them with other *Cyclemys* we began examining variation across all known populations of the genus. Our full analysis of variation is not yet complete (Iverson, McCord, van Dijk, Das, and Moll, pers. comm.), but our preliminary morphometric comparisons of over 180 *Cyclemys* representing all known areas of the range, of most of the type specimens, and of all phenotypes from typical *tcheponensis* to typical *dentata* (sensu McMorris 1976) revealed the existence of an unnamed population apparently associated with the Cardamom uplift in southeastern Thailand and adjacent Cambodia; indicated that *tcheponensis* is apparently not *morphometrically* distinct from *dentata*; and suggested that populations on Borneo and from China may also each be distinctive.

Although the new taxon seems to have a very limited distribution, it is now exported from Cambodia in great numbers. Therefore, it seems appropriate to name it now, before our full analysis of variation in the genus is complete, so that it might soon be given appropriate legal protection.

Materials and Methods

Shell and scute measurements (to the nearest 0.1 mm) were recorded from all available museum and pet trade specimens of *Cyclemys* (*sensu* McDowell 1964). Because we observed specimens with both the *tcheponensis* and *dentata* phenotypes from nearly everywhere across the composite range and because specimens without heads could not be allocated confidently to either phenotype, we lumped specimens by geography, establishing ten populations for analysis: India and Burma (0), northern Cambodia/Laos/Vietnam (1), southeastern Thailand and adjacent Cambodia (2), Thailand (3, excluding southeast Thailand), China (4), Malay Peninsula (5), Borneo (6), Sumatra (7), Java (8), and Philippines (9).

Preserved material was borrowed from the American Museum of Natural History (AMNH), the British Museum of Natural History (BMNH), the California Academy of Sciences (CAS), the Field Museum of Natural History (FMNH), the Museum of Comparative Zoology at Harvard (MCZ), the National Museum of Natural History in Paris (MNHN), the Oxford University Museum (OUM), the National Museum of Natural History in Leiden (RMNH), the Florida Museum of Natural History at the University of Florida (UF), the University of Kansas Museum of Natural History (KU), and the United States National Museum (USNM), and living material was available in McCord's private collection (WPM) (Fig. 1). Recorded measurements included maximum (not midline) carapace length (CL), maximum carapace width (CW), maximum carapace height (CH), maximum (not midline) plastron length (PL), maximum (not midline) length of the plastral forelobe from the interabdomino-interpectoral junction to a line across the anterior ends of the gular scutes (FL), maximum (not midline) length of the plastral hindlobe from the interabdominal-interfemoral junction to a line across the posterior ends of the anal scutes (HL), minimum (median) length of the plastral hindlobe from the interabdominal-interfemoral junction to the anal notch (NHL), plastral forelobe width at the level of the junction of the humeropectoral seam and the plastral margin (PWA), anterior

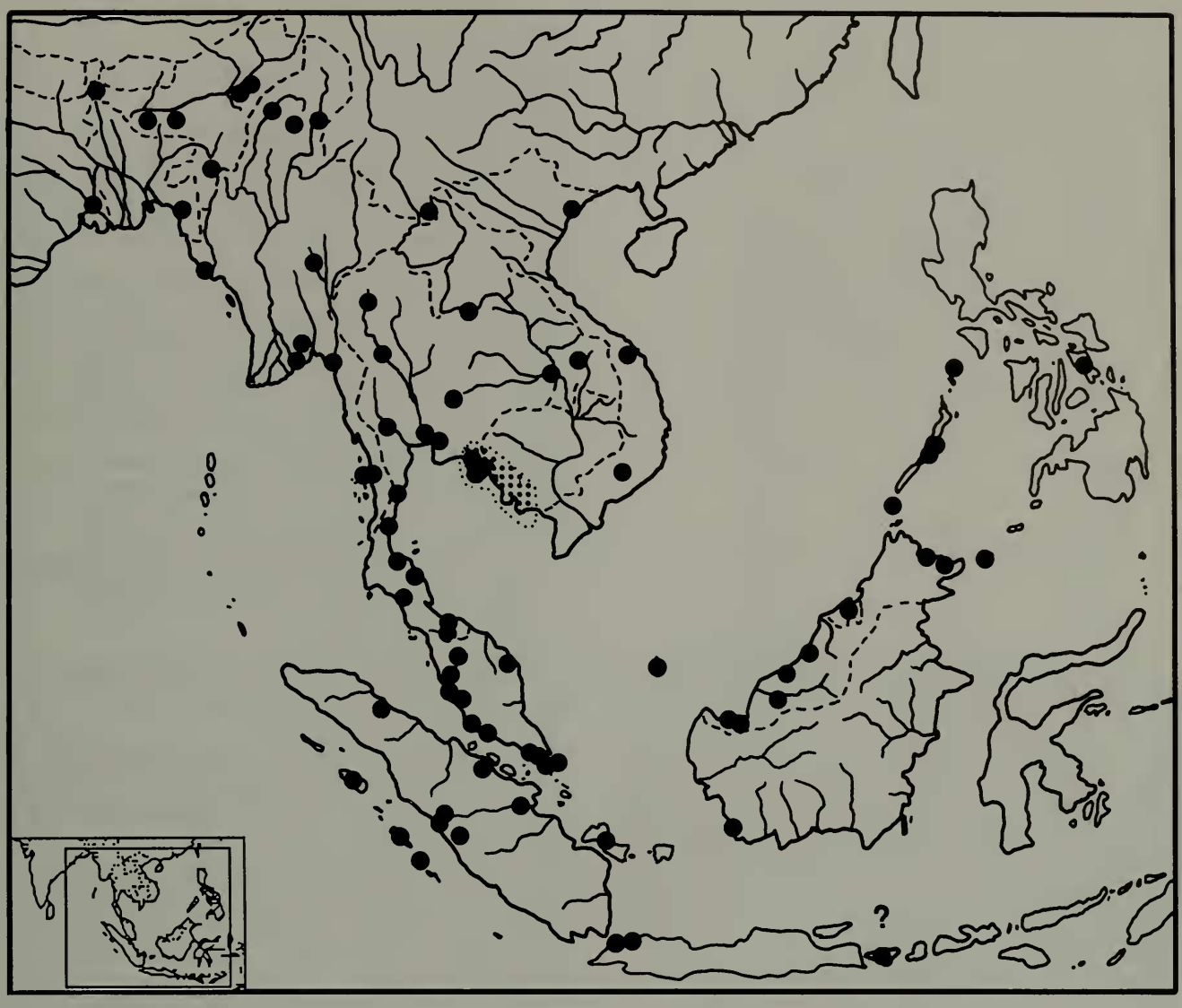

Fig. 1. Composite range map of *Cyclemys* in southeast Asia (from Iverson, 1992, and unpublished). Dots represent literature or museum locality records. Hatched area in Thailand and Cambodia encircles hypothesized range of *Cyclemys atripons*.

plastral hindlobe width at the level of the junction of the abdominofemoral seam and the plastral margin (PWC), posterior plastral hindlobe width at the level of the junction of the femoroanal seam and the plastral margin (PWD), left bridge length from axilla to inguinal pocket (BL), maximum ventral width across gular scutes (GW), maximum (not midline) length of right gular scute (GL), and lengths of right interhumeral (IH), interpectoral (IP), interabdominal (IAB), interfemoral (IF), and interanal (IAN) seams. Although there is some sexual dimorphism in some of these characters, females and males were analyzed together in order to include dried museum specimens lacking soft parts and subadults that could not be sexed confidently. Only adult and subadults (>110 mm CL) were included in this preliminary analysis.

The data were standardized for body size by division by carapace length. Although concerns have been expressed about the statistical validity of using ratios rather than residuals in quantitative analyses (Atchley et al. 1975, 1976; among others), multivariate analyses of ratios of turtle morphometric data have not yielded results that differed from those employing residuals (e.g., Berry 1978, McCord & Iverson 1991). In addition, the use of ratios offers the advantage of working with parameters that can be directly measured and/or compared; it is not possible to compare raw measurements

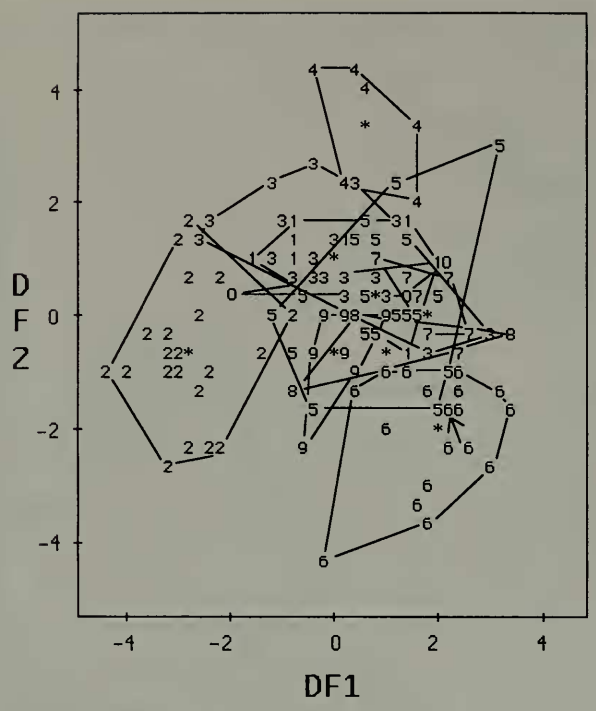

Fig. 2. Plot of first two canonical axes (discriminant functions DF1 and DF2) for specimens of *Cyclemys* based on discriminant function analysis of the ratios of 17 characters (listed in Table 1). First and second axes account for 44.9% and 27.2% of the variation, respectively. Country codes are India and Burma (0), northern Cambodia/Laos/Vietnam (1), southeastern Thailand and adjacent Cambodia (2), Thailand (3, excluding southeast Thailand), China (4), Malay Peninsula (5), Borneo (6), Sumatra (7), Java (8), and Philippines (9). The arrow marks the adult syntype of *Cyclemys ovata* Gray, which is grouped among the other Borneo turtles with a probability of 93%.

directly to mean values of a residual. The 17 character ratios produced by this standardization were then submitted to discriminant function analysis (DFA) with SPSS software (SPSS, Inc. 1983). ANOVA and pairwise population comparisons for the ratios of each variable to CL were made with Fisher's (protected) least significant difference (PLSD) test with STATVIEW software (Abacus Concepts 1992).

Results and Discussion

Both the discriminant function analysis (DFA; Fig. 2) and the analyses of variance of the ratios for the various populations of *Cyclemys* (Table 1) demonstrated that the population in southeast Thailand and adjacent Cambodia is morphometrically the most distinct of all populations. They also suggested that turtles from Borneo and those from China are divergent. The analyses revealed that, compared to other *Cyclemys* populations, those from SE Thailand/Cambodia tend to have a narrower carapace, a longer plastral hindlobe, a wider plastral forelobe, a narrower and shorter gular scute, and a longer interhumeral seam length; those from Borneo tend to have a deeper shell, a longer hindlobe, a longer gular scute, a shorter interhumeral seam length, a longer interfemoral seam length, and a shorter interanal seam length; and those from China tend to have a very narrow shell, a shorter and narrower plastral forelobe, a narrower plastral hindlobe, and a wider gular scute.

Untransformed data for the characters that varied most significantly in the ANOVA's and DFA (Table 1) were recombined into character ratios and examined to summarize variation within the genus *Cyclemys* (Table 2). That analysis reinforced the distinctiveness of the Thailand/Cambodia population and demonstrated significant overlap among most of the other populations; however, confirmation of the uniqueness of the Borneo and/or Chinese populations must await our additional analyses. Because the Thailand/Cambodia population is both allopatric and morphometrically distinct from other populations of *Cyclemys*, and because that population also differs in color patterns of the head and shell, we here describe it as:

Cyclemys atripons, new species
Black-bridged leaf turtle
Fig. 3.

Holotype.—USNM 81865, a dried shell of a female with limbs but no head, from Thailand, Krat [=Trat], Kao [=Mt.] Kuap (=Khao Kuap), collected 24 December 1929 by Hugh M. Smith.

Paratypes.—USNM 94745, an unsexed juvenile from Thailand, Chanthaburi, Kao [Mt.] Sabab (=Khao Sabap) collected 20

Table 1.—Results of univariate analysis of variance of ratios of 17 characters to carapace length across 10 populations of *Cyclemys* and for *Cyclemys atripons* (n = 29) versus all other populations (n = 106).

Character	Across all populations		*C. atripons* vs. others	
	f	P	f	P
Maximum carapace width (CW)	7.7	<0.0001	8.1	0.005
Maximum carapace height (CH)	8.1	<0.0001	11.0	0.0011
Maximum plastron length (PL)	1.9	0.06	6.5	0.012
Maximum forelobe length (FL)	0.6	0.78	1.4	0.24
Maximum hindlobe length (HL)	3.2	0.0017	5.8	0.018
Medial hindlobe length (NHL)	3.4	0.001	9.7	0.0022
Plastral width (PW1)	4.1	<0.0001	12.3	0.0006
Plastral width (PW3)	5.2	<0.0001	0.3	0.61
Plastral width (PW4)	2.6	0.008	0.4	0.55
Bridge length (BL)	2.2	0.029	4.7	0.032
Gular width (GW)	2.8	0.0046	9.5	0.0025
Gular length (GL)	2.1	0.032	8.3	0.0046
Interhumeral seam length (IH)	3.0	0.0025	14.1	0.0003
Interpectoral seam length (IP)	1.2	0.28	2.5	0.12
Interabdominal seam length (IAB)	3.1	0.0022	1.7	0.20
Interfemoral seam length (IF)	4.2	<0.0001	0.03	0.87
Interanal seam length (IAN)	4.3	<0.0001	4.0	0.047

November 1931 by Hugh M. Smith. USNM 53423, a dried shell of a female with separate head, limbs, and viscera in alcohol, and USNM 53424, an unsexed juvenile preserved in alcohol, from Thailand, Trat, Koh [= Ko = island] Chang, both collected in December 1914 by C. B. Kloss (see Smith & Kloss 1915). MCZ 29571, an unsexed juvenile preserved in alcohol, and MCZ 29572, a subadult (possibly male) in alcohol from Thailand, Gulf of Siam, Koh Kong (=Ko Chang), both donated in 1930 by Malcolm Smith. USNM 79515, a complete, mummified adult female from Thailand, Trat, Koh Kut (=Ko Kut), Gulf of Thailand collected 21 May 1929 by Hugh M. Smith. KU 47171 (formerly MCZ 29558), a dried shell of an adult, from "Bangkok, Siam" (certainly the shipping point rather than the actual collection locality), donated in 1930 by Malcolm Smith. UF 105992, an adult male preserved in alcohol, and UF 105993, a dried skeleton of an unsexed subadult; reported to have been collected from Tonle Sap, Phnom Penh, Cambodia [=Kampuchea], but purchased from local people in Phnom Penh by Mr. Anson Wong in the spring of 1994.

Table 2.—Morphometric characters useful in distinguishing *Cyclemys atripons* (n = 29) from other *Cyclemys* (n = 106). Character abbreviations are maximum carapace width (CW), maximum shell height (SH), width of anterior plastral lobe (PWA), median length of plastral hindlobe (NHL), maximum gular width (GW), maximum gular length (GL), and interhumeral seam length (IH). Values are means followed by range in parentheses. All character ratios are highly significantly different (P < 0.0001) by Fisher's (protected) least significant difference test.

Character	*Cyclemys atripons*	Other *Cyclemys*
IH/SH	0.293 (0.176–0.425)	0.231 (0.095–0.529)
IH/CW	0.132 (0.088–0.199)	0.106 (0.045–0.186)
PWA/CW	0.598 (0.503–0.671)	0.554 (0.451–0.651)
GL/NHL	0.278 (0.201–0.308)	0.305 (0.228–0.377)
GW/PWA	0.414 (0.335–0.503)	0.452 (0.371–0.562)

Diagnosis.—A medium-sized species of *Cyclemys* (carapace to 224 mm, but usually less than 200; to at least 250 mm in other *Cyclemys*) with an elongate, basically tricarinate carapace having an obvious middorsal keel and weak lateral keels and being nearly flat dorsally in adults; a plastron hinged between the pectoral and abdominal scutes (hyoplastral and hypoplastral bones); a very weakly hooked upper tomium with

a medial shallow notch or cusp; a relatively wide carapace (maximum width averages 78% of carapace length [CL] in *C. atripons*; 82% in other *Cyclemys*); a relatively low carapace (maximum shell height averages 35% of CL in *C. atripons*; 37% in other *Cyclemys*); a relatively wide plastral forelobe (posterior width averages 46% of CL in *C. atripons*; 45% in other *Cyclemys*); a relatively long plastral hindlobe (median length averages 50% of CL in *C. atripons*; 49% in other *Cyclemys*); a small gular scute (maximum length and width average 19% and 14% of CL, respectively, in *C. atripons*; 20% and 15%, respectively, in other *Cyclemys*); and a relatively long interhumeral seam (length averages 10% of CL in *C. atripons*; 8.5% in other *Cyclemys*) [see also Table 2 and Fig. 3]; a light cream to brown temporal and postorbital stripe on each side of head extending posteriorly onto the neck (flushed with salmon in juveniles), and a third narrower light stripe extending from the angle of the jaw to the ventral margin of the tympanum (sometimes connected to the postorbital stripe by a short vertical branch along the anterior margin of the tympanum) (basic pattern is similar to that in other *Cyclemys*); a nearly immaculate cream or yellow chin, lightly flushed with salmon in juveniles and sometimes with a few vague black flecks (darkly mottled to almost completely black in other *Cyclemys*); carapace light olive to brown to nearly black, with coarse black rays radiating from the areolae, but the lateral rays on C1–C3 disappearing with age, leaving the anterior rays in a bold, dense triangular concentration on the anterodorsal half of C1–C3 (carapacial rays, if visible, evenly distributed across costal scutes in other *Cyclemys*); the plastron with no or only a few coarse black rays on a cream to yellow-brown to horn-colored background, but with the bridge coarsely and densely flecked or streaked with black (entire plastron almost always heavily streaked with black [sometimes completely brown or black] in other *Cyclemys*).

Description (based on the type series as well as 12 adult females, 8 adult males, 6 unsexed subadults or juveniles alive in McCord's collection).—Carapace length to at least 191 mm in males and at least 224 mm in females, elongate, moderately tricarinate with a prominent medial keel and weak lateral keels, not domed (maximum shell height/CL = 0.308–0.395; mean = 0.352), nearly flat dorsally in full adults, widest at marginal M7 (maximum carapace width/CL = 0.703–0.898; mean = 0.781), with a slightly serrated posterior margin, and with moderately obvious growth annuli (least obvious in old individuals). Marginals all fairly uniform in length (along carapace margin); M5, 6.7, or 12 tallest; M9–11 usually flared. Cervical scute medium in size, usually longer than wide, indented medially along the posterior margin, and occasionally wider posteriorly than anteriorly. Vertebrals V2–5 wider than long; V1 usually wider than long, but not contacting seam between M1 and M2; V5 not even close to contacting M10. Prominent medial keel most pronounced on V4 and V5, but also obvious on V1 and V3; lateral keels weak, but most pronounced on costal C3. Carapace olive to brown to nearly black, with seams more darkly marked; coarse black rays radiate from the areolae; however, rays extending to the marginals on costals C1–C3 fade with age such that adults appear to have a dense triangular concentration of black streaks on the anterodorsal half of C1–C3 (Fig. 3); carapacial keels not distinctly colored unless due to abrasion, but medial keel in subadults and most adults tending to lack black pigment, giving the impression of a weak, light midvertebral stripe (particularly evident on the nuchal scute).

Maximum plastron length shorter than carapace length (PL/CL = 0.899–1.039; mean = 0.975). Plastron very slightly upturned anteriorly, with hinge present between the hyoplastral and hypoplastral bones (approximately aligned with the seam between the pectoral and abdominal

Fig. 3. *Cyclemys atripons*. Left (plastral views; top to bottom): carapace of first year turtle, USNM 94745, 78 mm carapace length (CL); subadult, WPM 001, 132 mm CL; adult, WPM 003, 191 mm CL. Right (top to bottom); juvenile, WPM 002, 135 mm CL; subadult, WPM 001, 132 mm CL; adult female, WPM 004, 196 mm CL.

scutes). Plastral forelobe width (PWA) at level of junction of humeropectoral seam and lateral plastral margin relatively wide (PWA/CL = 0.420–0.507; mean = 0.464). Median length of plastral hindlobe lobe (NHL) relatively long (NHL/CL = 0.441–0.536; mean = 0.501). Plastral hindlobe with relatively shallow anal notch. Bridge moderately long (BL/CL = 0.304–0.360; mean = 0.336); axillary and inguinal scutes very reduced or absent. Gular scute relatively small (GW/CL = 0.162–0.216; mean = 0.192; GL/CL = 0.108–0.163; mean = 0.139), but interhumeral seam relatively long (IH/CL = 0.065–0.155; mean = 0.103). Average plastral formula (see also Table 2 and Fig. 1 for diagnostic ratios): interpectoral seam (IP) > interabdominal seam (IAB) ≃ interanal seam (IAN) ≫ gular length (GL) ≃ interfemoral seam (IF) ≥ interhumeral seam (IH). Plastron cream, yellow-brown, or horn colored, with seams more darkly marked with brown; no or only a few short, coarse, black flecks or rays present (Fig. 3); bridge area with obvious coarse black rays or flecks radiating anteriorly and laterally (not medially) from the scute areolae. Ventral surfaces of M4–M7 more boldly marked with black rays or flecks than on other marginals.

Head of medium width; upper jaw weakly hooked, but with a shallow median notch; triturating surfaces narrow. A few small tubercles evident between angle of jaw and tympanum. Dorsum of head coarsely flecked with black on a greenish-brown background. A light cream to brown temporal and postorbital stripe on each side of head, extending posteriorly onto the neck (flushed with salmon in juveniles), and a third narrower light stripe extending from the angle of the jaw at least to the ventral margin of the tympanum (sometimes connected to the postorbital stripe by a short vertical branch along the anterior margin of the tympanum); these stripes darken with age but are still evident even in old individuals (see Fig. 3). Chin cream or yellow (lightly flushed with salmon in juveniles), with a few or no vague black markings; most frequent black mark on chin a short, thin median line subequal to orbit diameter. Neck with six vague light stripes ventrally (parallel to and between the stripes extending posteriorly from the angle of the jaws). Tomia cream to yellow brown to dark gray with several coarse black streaks. Vague black horizontal line across eye (through pupil); iris light green to brown.

Anterior surface of antebrachium covered with large, imbricate scales, the largest of which are crescent to spade-shaped; largest scales on hindlimb at heel, but generally smaller than largest forelimb scales. Upper parts of limbs and tail covered with fine scales. Exposed dorsal parts of forelimbs dark brown (rarely almost black) with black flecks; ventral surfaces cream to yellow and unmarked; dorsal surface of digits generally lighter in color than lateral surfaces. Dorsal surface of hindlimbs dark gray-brown to black; ventral surfaces cream colored. Narrow cream colored stripe on posterior margin of each hind limb, extending at least to heel; dark stripe immediately ventral to it, extending to anal region in all but the oldest specimens. Cream colored soft parts between hindlimbs and tail washed with salmon in some juveniles. Recessed areas of inguinal and axillary regions and between neck and forelimbs uniform cream color. Tail (even in males) relatively short, dark gray to brown, with a black middorsal stripe and a ventrolateral dark brown stripe on each side.

Males and females both with a flat or slightly convex plastron. Males with a slightly longer tail than females; vent generally at level of posterior carapace margin in males and anterior to it in females.

The single available, incompletely prepared skull associated with UF 105993 has the maxillae separated anteriorly by the premaxillae; pterygoid barely in contact with the jugal; foramen posterius palatinum small and similar in size to the foramen orbitonasale; fissura ethmoidalis extremely narrow ventrally, distinctly key-hole

shaped; cranial cavity not ventrally narrowed by the processi inferiores parietales; and quadratojugal present as part of postorbital bar.

Etymology.—From the Latin, *atri*, meaning black, and *pons*, meaning bridge, in reference to the darkly pigmented bridge in this species that contasts so strongly with the usually unmarked plastron.

Other material.—Twenty-six live specimens in the collection of William P. McCord (WPM 1–26), to be deposited on death in the UF collection.

Distribution.—Apparently restricted to the isolated hill country of extreme southeastern Thailand and southwestern Cambodia, in association with the Cardamon mountain range, including the Gulf of Thailand islands of Koh Chang and Koh Kut (the two largest and most mountainous islands in the area). Recent pet trade specimens, said to be coming from Tonle Sap, a lowland wetland near Phnom Penh, Cambodia, more likely came from the hill country to the southwest. The nearest confirmed record for *Cyclemys dentata* is from Sakaeret, Thailand (FMNH 183723-39; Inger & Colwell 1977), ca. 275 km to the north-northwest.

Remarks.—Our preliminary analyses support the suggestion by Das (1995a, 1995b) that the population on Borneo is distinctive. Should our further analysis confirm its distinctiveness, the name *Cyclemys ovata* (Gray 1863:178 from Sarawak) is available (see also Fig. 2). If our preliminary results regarding the distinctiveness of the Chinese population are confirmed, the name *Cyclemys tiannanensis* Kou 1989:193 (from Yunnan) may be applicable to the Chinese population we sampled, even though the name was based on a single aberrant specimen. In our preliminary analysis we could find no morphometric character to distinguish *tcheponensis* from *dentata*. It has been suggested that color pattern differences between these two may reflect altitudinal variation more than regional variation (Frank Yuwono, pers. comm.). However, our final conclusion on the validity of *tcheponensis* must await completion of our broader analysis (including juveniles).

Zoogeography.—*Cyclemys atripons* is apparently not the only species endemic to the hill country of southeastern Thailand and adjacent Cambodia. According to Peter Paul van Dijk (pers. comm.), at least the following two frogs and two lizards are endemic to the same area: *Rana fasciculispina*, *Rana kohchangae*, *Isopachys roulei*, and *Pseudocalotes floweri*.

Comparative material examined: *Cyclemys dentata* (sl): India (BMNH 1930.6.8.4, OUM 8502 [syntype of *Cyclemys orbiculata*], OUM 8513 [syntype of *Cyclemys orbiculata* and holotype of *Cyclemys bellii*], RMNH 6073, and USNM 293726); Burma (AMNH 58423, BMNH 1947.3.5.63 [syntype of *Cyclemys oldhami*]); China (WPM 6 specimens); Thailand (BMNH 1947.3.4.26 [syntype of *Cyclemys oldhami*], BMNH 62.8.18.20, FMNH 183727–728, 183730, 183732, 183735, 183737–738, MCZ 29561–566, 29568–570, 29573, 43066–067, 43084, USNM 26249, 94602, 269918–919, WPM 3 specimens); Laos (USNM 103016); Vietnam (MNHN 1948.38, RMNH 4751, USNM 95100, WPM 12 specimens); Malay Peninsula (AMNH 49933, FMNH 142501, 166553, 224081–082, 224085–092, 251501, 251508, USNM 30961, 30964, WPM 8 specimens); Sumatra (BMNH 1979.221, CAS-SU 8615, RMNH 3838, USNM 37792, WPM 11 specimens); Java (BMNH 1946.1.22.62 and 1946.1.22.63 [syntypes of *Emys dentata*], MNHN 9107 [syntype of *Cistudo diardii*], USNM 62576, WPM 2 specimens); Philippines (AMNH 90102, CAS 62166, 134331–332, 157280, FMNH 51598, KU 47172, 79176, MCZ 25569, USNM 229500–501, 496884); and Borneo (BMNH 63.6.21.1 [syntype of *Cyclemys ovata*], FMNH 14974, 63276–278, 128257, 128259, 151015, 166554, MCZ 11244, USNM 38534, WPM 16 specimens).

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